IS 3637 (1966): Gas operated relays [ETD 35: Power Systems Relays]

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Indian Standard

SPECIFICATION FOR GAS-OPERATED RELAYS

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard
SPECIFICATION FOR GAS-OPERATED RELAYS

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SPECIFICATION FOR GAS-OPERATED RELAYS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 13 June 1966, after the draft finalized by the Relays Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard has been prepared to outline the requirements of gas-operated relay (also known as Buchholz relay), which is widely applied for protecting oil immersed electrical apparatus fitted with separate conservator vessel. The ability of the relay to detect variety of faults inside an oil immersed electrical apparatus has made it a popular protective device for such apparatus. Its simplicity in application and its relative inexpensiveness are also factors commending it to wide use.

0.3 With increasing production and use of oil immersed electrical apparatus in this country, the demand for this relay is on the increase. This standard has been prepared to guide the indigenous producers and the users of this relay as to its minimum requirements.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off. in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers requirements and methods of test for gas-operated relays intended for installation in the connecting passage of oil between the main tank of an oil immersed electrical apparatus and its oil conservator vessel.

1.2 This standard covers gas-operated relays fitted with both alarm and trip elements.

1.3 Although this standard does not specifically exclude gas-operatec relays intended only for alarm, special provisions intended only for such relays have not been included.

*Rules for rounding off numerical values (*revised*).

1.4 This standard does not cover gas-operated relays which are not intended to be installed in the oil passage between the main tank and the conservator. It also does not cover gas-operated relays used for the protection of oil immersed apparatus mounted on railway vehicles.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

NOTE — Reference is also invited to IS : 1885 (Part IX)-1966*.

2.1 Relay — A device designed to produce sudden predetermined changes in one or more *physical* system(s) on the appearance of certain conditions in the *physical* system controlling it.

NOTE — In the case of gas-operated relay the cause of response is considered indirectly electrical.

2.2 Gas-Operated Relay — A relay whose operation depends upon the quantity and/or pressure of gas and/or velocity of flow of liquid.

2.3 Energizing Quantity — The quantity which alone or in combination with other quantities, must be applied to the relay to enable it to function (for example, the voltage and current for all-or-nothing relay, the voltage and current for a power relay and impedance relay, the voltage for a frequency relay, the current for a bias current relay or gas or flow of liquid for a gas-operated relay.

2.4 Operating Time — For a given operation and the relay in its initial position, the time between the instant when a specified value of energizing quantity able to operate the relay is suddenly applied and the instant when the relay operates.

2.5 Make Contact (Normally Open Contact) — A contact which is open when the relay is de-energized.

2.6 Making Capacity — The maximum current and volt-amperes that the contact is able to make successfully under specified conditions without significant damage to the contact.

2.7 Current Carrying Capacity — The maximum current which the contact is able to carry continuously.

2.8 Alarm Device — A device which responds to accumulation of gas, in the relay body and causes a switch to close for an external alarm circuit.

2.9 Trip Device — A device which responds to velocity of flow of oil towards the free oil level in a protected apparatus and/or loss of oil in the relay body and causes a switch to close for an external trip circuit.

*Electrotechnical vocabulary : Part IX Electrical relays.

2.10 Type Tests — Tests carried out to prove conformity with the requirements of this specification. These are intended to prove the general quality and design of a given type of relay.

2.11 Routine Tests — Tests carried out on each relay to check requirements likely to vary during production.

3. RATING

3.1 The standard ratings of a relay shall be in accordance with Table 1.

TABLE 1 STANDARD RATINGS

NOMINAL PIPE BORE	ENERGIZING QUANTITY	
	Gas Volume for Alarm at 5° Pitch Angle	Steady Oil Flow for Trip at 1° to 9° Pipe Angle
mm	cm^3	cm /sec
25	90 to 165	70 to 130
50	175 to 225	75 to 140
80	200 to 300	90 to 160

3.2 The relay shall operate satisfactorily in the following conditions of oil:

Oil temperature	10° to 100°C
Oil viscosity	65 to 75 centistokes at 10°C
	2 to 3.5 centistokes at 100°C

3.3 The current rating of the switch shall be 2 amperes at 240 volts, 50 Hz ac or dc. The resistance of this switch shall not exceed 0.1 ohm and the cross-section of current leads connected to it shall preferably not be less than 0.25 mm^2.

4. CONSTRUCTION

4.1 The relay housing shall be weather resistant, shall be free from mechanical defects and shall withstand pressures encountered in normal service. No rain-water shall be allowed to accumulate on the relay, or to seep into its interior.

4.2 A surface on the top of housing shall be machined to facilitate mounting of relay at site to its correct orientation.

4.3 A substantial inspection window of tough transparent material shall be fitted on each side of the relay housing through which it is possible to see the oil level. Viewed from the front, it shall be possible to ascertain the volume of gas present in the relay in cubic centimetres on a calibrated scale.

4.4 A pet-cock complete with a screwed cap shall be provided on the top of the relay. A similar pet-cock may also be provided in a convenient position to facilitate site testing of the trip device.

4.5 The inner parts of the relay shall be built of material which will withstand effects of hot transformer oil and its disintegration products likely to be encountered in service.

4.6 The design and mounting arrangements for the switches shall be such that maloperation does not occur under normal service conditions of the protected apparatus on which the relay is mounted.

4.7 The connecting leads from the switch shall be made of tinned copper flexible wire insulated with ceramic beads or with braided silk or with any other equivalent insulating material. They shall be terminated on outlet bushings by means of compressed terminal lugs or by other similar method. Soldered connection shall not be employed.

4.8 The outlet terminals shall be suitable for connection to external conductors of size 1.5 to 4 mm^2 and housed in a weather-proof air insulated terminal chamber on the relay housing. A suitable conduit entry and bottom drain hole in the chamber shall be provided.

4.9 A mechanical device capable of being operated from the exterior of the relay to check the continuity of electrical circuits and lock the alarm and,trip devices whilst the relay is in transit, may be provided.

4.10 The dimensions of mounting flanges shall be in accordance with IS: 3639-1966*. If threaded connections are used in the pipe, the relay flanges and the pipes shall be threaded to sizes P1, P2 and P3 in accordance with IS : 554-1964† for relay sizes 25, 50 and 80 mm nominal pipe bore respectively.

5. NORMAL SERVICE CONDITIONS

5.1 The relay shall be suitable for operation at the conditions at which the apparatus on which it is mounted is expected to operate (for mounting on transformers *see* Appendix A of IS : 2026-1962‡).

6. MARKING

6.1 The following particulars shall be marked distinctly and permanently on every relay in a position preferably visible from the front:

a) A reference to this standard, that is 'Ref ISS 3637';

b) Manufacturers' name and/or trade-mark;

c) Country of manufacture; and

d) Manufacturers type reference and serial number.

*Specification for fittings and accessories for power transformers.

†Dimensions for pipe threads for gas list tubes and pressure tight screwed fittings (*revised*).

‡Specification for power transformers.

6.1.1 The direction of oil flow through the relay causing operation of the relay shall be indelibly marked by an arrow head which should be conspicuously visible.

6.1.2 The outlet terminals of the alarm and trip devices shall be indelibly marked by letters *A* and *T* in their proximity in the terminal enclosure.

6.1.3 A graduated scale to read the volume in cubic centimetres of gas accumulated inside the relay shall be provided.

6.2 BIS Certification Marking

The product may also be marked with Standard Mark.

6.2.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7. TESTS

7.1 Classification of Tests

7.1.1 *Type Tests* — The following shall comprise the type tests:

a) Porosity test (**7.2**),
b) High voltage and insulation resistance test (**7.3**),
c) Elements test (**7.4**),
d) Gas volume test (**7.5**),
e) Loss of oil and surge test (**7.**6),
f) Mechanical strength test (**7.7**), and
g) Velocity calibration test (**7.8**).

7.1.2 *Routine Tests* — The following shall comprise the routine tests and shall be carried out on all relays:

a) Porosity test (**7.2**),
b) High voltage and insulation resistance test (**7.3**),
c) Elements test (**7.4**),
d) Gas volume test (**7.5**), and

(e) Loss of oil and surge test (**7.6**)

7.2 Porosity Test — Each finished relay casing complete with cover shall be filled, with oil at ambient temperature and at a pressure of 1.5 kg/cm^2 for a duration of 4 hours or 3 kg/cm^2 for a duration of 0.5 hour. There shall be no leakage or sweating to the exterior or other sign of mechanical fault.

7.3 High Voltage and Insulation Resistance Test — An alternating voltage of 2 000 volts at 50 Hz shall be applied for one minute (alternatively 2 500 volts for one second) between each electrical circuit in turn and the casing, the remaining circuit being connected to the casing, the switches having been put to 'ON' position and the relay being devoid of oil. The test voltage shall be satisfactorily withstood.

The insulation resistance to earth at each terminal and between terminals of the relay measured with a 500-volts megger shall not be less than 10 megohms.

7.4 Elements Test — Each completely assembled relay shall be filled with oil at ambient temperature at a pressure of 1.75 kg/cm^2 for 15 minutes. No leakage shall occur from the casing or into normally oil free spaces, such as floats within the casing.

7.5 Gas Volume Test — The completely assembled relay filled with oil shall be mounted at an angle of 5° to the horizontal and air or gas shall be introduced in it until the alarm device closes the alarm contacts. The volume of gas collected in the relay shall be within the rated range specified in Table 1. The air or gas shall be further allowed to escape freely from relay in the direction marked on the relay. The trip device shall not operate and shall hold the trip contacts open.

7.6 Loss of Oil and Surge Test — Each completely assembled relay filled with oil at ambient temperature shall be mounted at an angle within the limits of 1° to 9° to the horizontal and subjected to a sudden surge of oil to operate the trip device. The equivalent steady flow figures shall be stated in the test certificates.

The oil level in the relay shall be dropped to the bottom of the pipe bore on the conservator side and the trip device shall operate to close the trip contacts.

7.7 Mechanical Strength Test — The relay casing and cover in a finished state shall be filled with oil at ambient temperature and subjected to an internal pressure of 8 kg/cm^2 for a period of one minute. There shall be no mechanical failure.

7.8 Velocity Calibration Test — The relay shall be mounted at 5° angle to the horizontal and filled with oil. A steady oil flow velocity in the

direction of the marked arrow shall be produced and the minimum velocity at which the trip device operates to close the trip contacts shall be determined.

The velocity reading shall be determined at different mounting angles to cover the entire range of tilt prescribed by the manufacturer and a curve of tilt angle versus velocity shall be plotted which shall agree with the standard.

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